Frequency of Extreme Events and Injury Risk from Motor Vehicle Accidents in Maryland, USA

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Introduction

- Motor vehicle collisions are among the leading causes for morbidity and mortality across the U.S. In 2013, 2.3 million injuries occurred as a result of a collision.
- Several studies have shown varying associations between an increase in precipitation and motor vehicle collisions.
- Recent IPCC report suggest that extreme weather events will continue to increase in intensity, frequency, and duration in response to changing climate.
- There is limited understanding of the relationship between the frequency of extreme precipitation and heat events and injury as well as death from motor vehicle collision.

Case Information and Analysis Approach

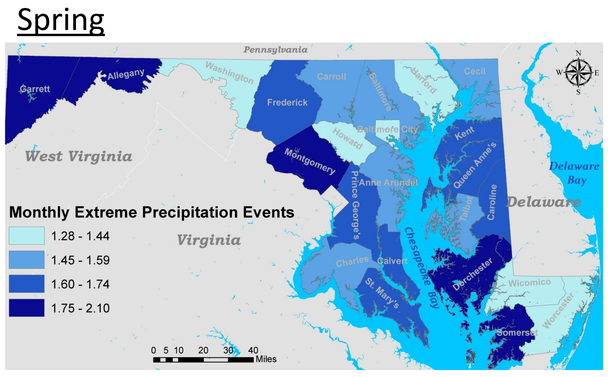
Study Area
- The State of Maryland, U.S.A.

Exposure Metric
- Extreme heat and precipitation days

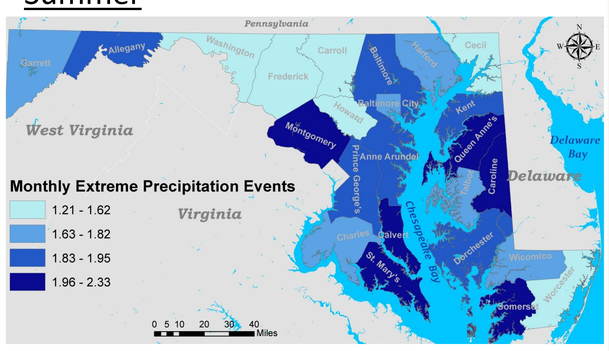
Data
- 461,009 injuries or death due to motor vehicle collisions in Maryland from 2000 to 2012
- Source: Maryland Automated Accident Reporting System

Monthly Average of Extreme Precipitation Events By Season 2000-2012

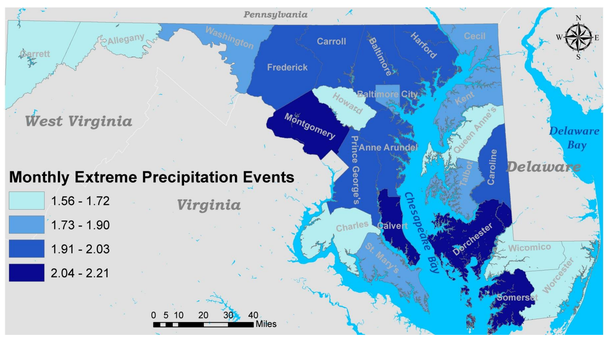
Spring



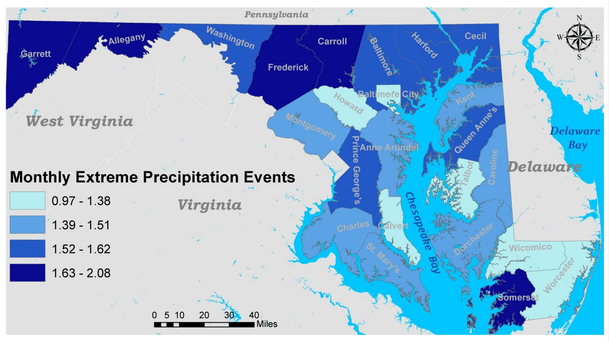
Summer



Fall



Winter



Approach
- Extreme heat and precipitation events were identified using location and calendar day specific thresholds (95th %ile for heat, 90th %ile for precipitation) calculated using 30 year baseline (1960-1989).
- Collision data were combined with extreme heat and precipitation.

Statistical Analysis
- Time-stratified, bidirectional, semi-symmetric case-crossover design used to assess the associations between extreme heat and precipitation events and risk of injury and death as a result of a motor vehicle collision.

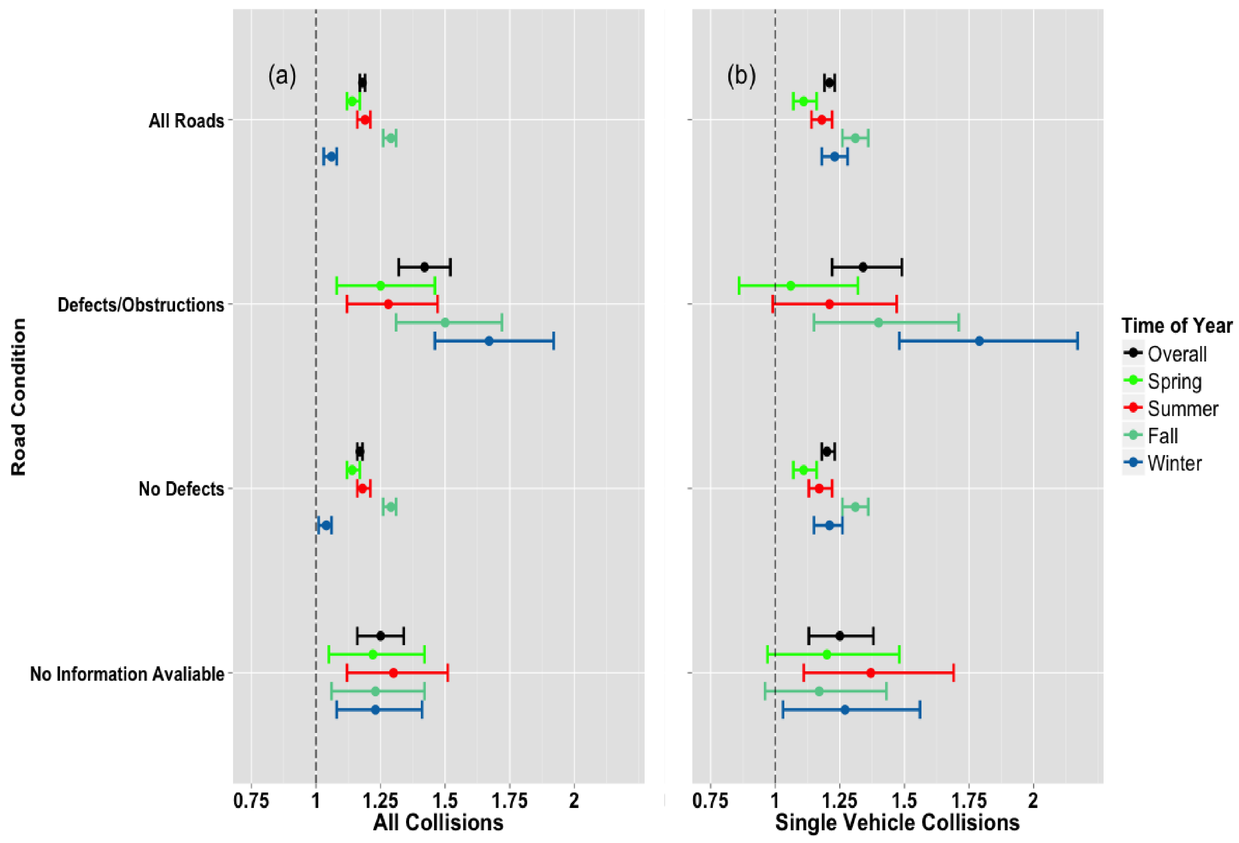
Table 1. Motor vehicle injuries (including death) by season and road type from January 1, 2000 to December 14, 2012.

Motor Vehicle Injuries – No. (%)					
	Categorized by Season[a]				
Characteristic	**Spring**	**Summer**	**Autumn**	**Winter**	**Total**
Road Type (all)	115,299 (25.0)	120,258 (26.1)	119,509 (25.9)	105,943 (23.0)	461,009
No Information	110,900 (25.1)	115,740 (26.2)	115,054 (26.0)	100,635 (22.8)	442,329
Road w/o Defects	2,240 (23.9)	2,140 (22.8)	2,220 (23.7)	2,773 (29.6)	9,373
Road with Defects	2,159 (23.2)	2,378 (25.6)	2,235 (24.0)	2,535 (27.2)	9,307

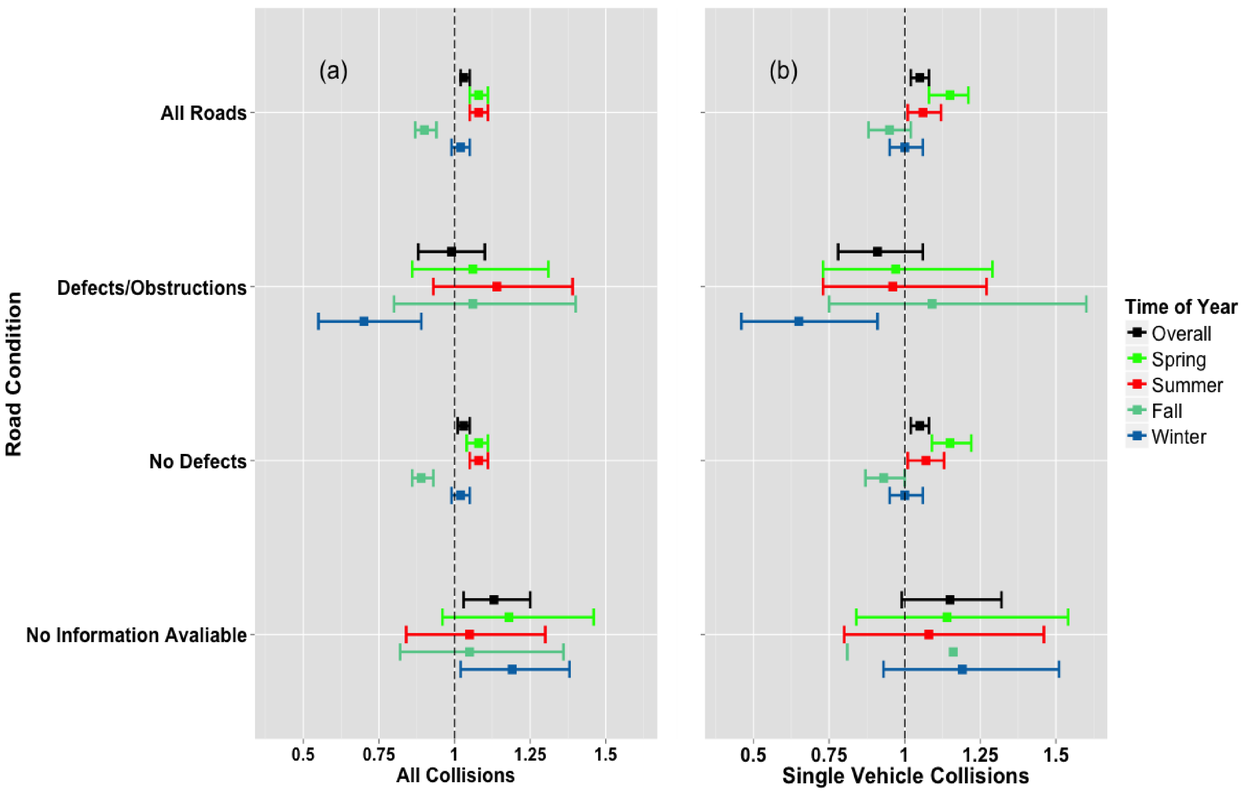
Percentages may not sum to 100% due to rounding
[a]Seasons are: spring (March-May); summer (June-August); autumn (September-November); and winter (December-February)

Results

Odds Ratio (95%CI): Exposure to Extreme Precipitation Analysis



Odds Ratio (95%CI): Exposure to Extreme Heat Analysis



Summary

- Across Maryland, a one day increase in extreme precipitation event was associated with an 18% increase in injury from motor vehicle collision. The risk increased to 29% for extreme precipitation events during autumn.
- Extreme precipitation related increase in injuriy due to motor vehicle collision was considerably higher when a road defect or obstruction was present (OR: 1.42, 95% CI: 1.32, 1.52).
- Changes in risk associated with extreme heat were generally marginal.

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